



Swami Ramanand Teerth Marathwada University, Nanded

Choice Based Course Credit System (distribution and details of CBCS)

M.Sc. (Computer Science)

First Year (Two Semesters)

Semester-I					
course code	Title of the paper	External credit	Internal credit	Total Credits	Total Nor of Classes
CS-101	Computer Architecture & Microprocessor	3	1	4	40hrs
CS-102	Programming in C++	3	1	4	40hrs
CS-103	Design Analysis of Algorithm	3	1	4	40hrs
CS-104	Distributed Database Concepts	3	1	4	40hrs
CS-105	Lab-1 (Programming in C++)	1	1	2	60hrs
CS-106	Lab-2 (Computer Architecture)	1	1	2	60hrs
Total Credits		14	6	20	280hrs

Semester-II					
course code	Title of the paper	External credit	Internal credit	Total Credits	Total Nor of Classes
CS-201	Advance Networking Concepts	3	1	4	40hrs
CS-202	Mobile Computing	3	1	4	40hrs
CS-203	C#.NET	3	1	4	40hrs
CS-204	Compiler Design	3	1	4	40hrs
CS-205	Elective-II	3	1	4	40hrs
	1. Discrete Event System simulation				
	2. Distributed Computing				
	3. Network Programming				
CS-206	Lab-3(Advance N/W Concepts)	1	1	2	60hrs
CS-207	Lab-4(C#.NET)	1	1	2	60hrs
CS-208	Seminar	1	0	1	40hrs
Total Credits		18	7	25	360Hrs



CS-101 Advanced Computer Architecture & Microprocessors(4-Credits)

Unit 1: Design Methodology

Introduction to system modeling, Design levels of Combinational and Sequential circuits- Gate level, Register level and Processor level, Queuing Model, Simulation.

Unit 2: Binary Arithmetic

Fixed point arithmetic's and algorithms for addition, subtraction, multiplication and division, Floating point arithmetic's and algorithms for addition, subtraction, multiplication and division.

Unit 3: Processors Design & Control Units

Processor organization, Information representation, Instruction –Format, types, Implementation, CICS and RISC, Vector Concepts, Control Unit-Hardwired and Micro programmed control unit, Interrupt and Branch Instruction processing.

Unit 5: Memory Organization

Virtual memory, Memoryhierarchies, Main memory -allocation, Segmentation, High speed-interleaved and associative memories.

Unit 5: 8085 Microprocessor

Architecture of 8085 Microprocessor, Features of 8085, Pin diagram of 8085, Timing diagram of Memory read , memory write, Opcode fetch and execute cycle, Addressing modes, DE multiplexing of address and data bus, Instruction set –classification, Instruction timing ,Assembly language programming of 8085.

Unit 6:8086 Microprocessor

Architecture of 8086 Microprocessor-EU and BIU, Features of 8086, Pin diagram of 8086,Addressing modes, Instruction set classification , Assembly language programming of 8086.

Reference Books:-

- 1) Computer Architecture & Organization by J.P Hays.
- 2) Fundamentals of Microprocessors by B.Ram.
- 3) Fundamentals of Microprocessors by Gaonkar



(CS) - 102 Programming with C++ (4-Credits)

Unit – 1 Introduction and basic concepts of C++

Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic concepts of OOP's, Benefits and Applications, Structure of C++ program

Unit – 2 Tokens, Operators and Functions in C++

Keywords, Identifiers, Data-types, Operators in C++, Operator precedence and associativity, Function, function prototype, default arguments, Reference variable, call by reference, return by reference, Inline function, function overloading

Unit – 3 Class and object

Specifying a class and object, Nesting of member function, Memory allocation for objects, Static data member, static function, Friend function, Returning objects

Unit – 4 Constructor and destructor

Constructor, Types of constructor, Destructor

Unit – 5 Inheritance and polymorphism

Types of inheritance, Virtual base class, Operator overloading (Unary and binary), Virtual function and there rules, Pure virtual function, Abstract class, Pointer to object, This pointer

Unit – 6 Input / Output Operation

Console I/O operation, formatted I/O, unformatted I/O, C++ classes for console I/O, C++ stream classes for file I/O, Opening and closing file, sequential and random access, Error handling during a file operation, command line arguments, Templates, template function, template class.

Reference Books:-

- 1) The C++ Complete Reference -TMH Publication
- 2) Object-Oriented Programming with C++ -E-Balgurusamy
- 3) Let us C++ -Yashwantkanetkar



(CS) – 103 Design and analysis of an algorithm (4-Credits)

Unit-I Introduction to data structure

Concepts of data and algorithm, Time and space Complexity of a given algorithm

Unit-II Divide and Conquer

General Method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication

Unit-III The Greedy method

The general method, Knapsack problem, Optimal storage on tapes, Job sequencing with deadlines, Optimal merge pattern, Minimum spanning tree, Shortest path

Unit-IV Dynamic Programming

The general method, Multistage graphs, Optimal binary search tree, Reliability Design, Travelling sales person problem

Unit-V Basic search and traversal techniques

Binary tree traversal, Breadth first search(BFS), Depth first search(DFS), Bi-connected components and DFS

Unit-VI Backtracking

The general method, The 8-Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycle, Knapsack problem, Efficiency consideration

Reference Books :

1. Fundamentals of computer algorithm by Horowitz Sahani, Galgotia Publication



CS 104 Distributed Database System (4-Credits)

Unit 1 :Database System Architectures

Centralized Architectures, client server Architecture, Server System Architecture , Parallel System Distributed System , Network Types

Unit 2 :Distributed Database

Homogeneous and Heterogeneous Databases , Distributed Database storage, Transaction Concept ,Distributed Transactions, Commit Protocols, Concurrency control in distributed databases, Availability, Serializability, Distributed Query Processing , Heterogeneous Distributed Databases , Distributed Database in Oracle

Unit 3 :Parallel Database

Introduction, I/O Parallism, InterqueryParallism, IntraqueryParallism, Interoperation Parallism, IntraoperationParallism, Design of Parallel system,

Unit 4 :Decision Support System & Indexing and Hashing

Introduction, Aspects of decision support, Database design for Decision support, Data Preparation

Data warehouses and Data marts, Online Transaction Processing (OLTP) ,

Basic Concepts, Ordered indices, B tree index files, B+ tree index files, Multiple key access, Static Hashing, Dynamic Hashing, Comparison of Ordered indexing and Hashing, Bitmap indices

Unit 5 :Advanced Data types and New Applications & Advanced Transaction Processing

Motivation, Time in Database, Spatial and Geographic data, Multimedia Databases, Mobility and Personal Databases. Transaction Processing Monitors, Transactional Workflows, Main memory databases, Real time transaction system, Long duration transactions, Transaction Management in Multidatabases

Unit 6 :Recovery System

Failure classification, Storage structure, Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery With concurrent Transactions, Failure with loss of Non-volatile storage, Advanced recovery technique, Remote backup system



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Reference Books –

1. Database System Concepts - (Abraham, Korth and Sudarshan (4th edition) Tata McGraw-Hill)
2. An Introduction to Database systems - C. J. Date (3rd Edition) Pearson Education



CS-201 Advanced Networking Concepts(4-Credits)

Unit-I :Review of Basic Concepts

Network Architecture – Protocol Hierarchies, Layered model, services, interface , Reference Models, Underlying Technologies

Unit-II :LAN Hardware

Network Interface card , Transmission Media , Topologies , Active hub and passive hub , Repeaters Wireless LAN.

Unit- III :The Internet Layer & Routing Protocols

IP-Datagram , fragmentation and reassembly, ICMP –types of messages, error reporting, ICMP package, BOOTP and DHCP, Interior and Exterior routing – RIP, OSPF, BGP, Multicast Routing- Unicast, Multicast and Broadcast, Multicasting, Multicast trees.

Unit-IV :The Transport Layer

The transport service –Services provided, services primitives, Sockets, Process-to-process communication, Elements of transport protocols – addressing, connection establishment, connection release, flow control and buffering , multiplexing, crash recovery, UDP- Introduction, Remote Procedure Call , TCP –service model, protocol, frame format , connection establishment, release, connection management, error control, congestion control.

Unit- V :Client –server Model & The Application Layer

Client-Server Model- Concurrency , Processes, Socket Interface –sockets, byte Ordering, Socket system calls, connectionless and connection Oriented applications , DNS Telnet and Rlogin, FTP, TFTP, SNMP, SMTP, World Wide Web(Client and server side, cookies, wireless web), Java and the internet

Unit-VI :Introduction to Network security

Cryptography, symmetric key algorithm, Public key algorithms, Digital signatures, Certificates, IPSec, Firewalls, Virtual Private Networks, Network Address Translation, Authentication protocols, Social Issues .



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Reference Books:

1. BeehrouzForouzan , TCP/IP protocol suit , second edition, Tata McGraw Hill
2. Andrew S. Tanenbaum, Computer Networks , Fourth Edition, Prentice Hall
3. Douglas E. Comer, Internetworking with TCP/IP , vol 1,
4. William Stallings, Data and Computer Communications , Seventh edition , Pearson Edition

Lab Assignment

1. Assigning an IP-address to client and server
2. Design a LAN with a given set of requirement.
3. Configuration of DHCP
4. Configuration of DNS
5. Active Directory Configuration
6. Creating an Network Users
7. Creating an Shared folders
8. Interconnecting client and server



CS – 202 Mobile Communications (4 – Credits)

Unit-I :Introduction

Applications, Vehicles, Emergencies, Business, Replacement of wired networks , Infotainment and more, Location dependent services, Mobile and wireless devices A short History of wireless communication, A market for mobile communication Some open research topics, A simplified reference model,

Unit –II :Cellular System

Basic Cellular System Performance Criteria, Operation of Cellular System ,Planning a Cellular System.

Unit-III :Wireless transmission

Frequencies for radio transmission, Regulations , Signals, Antennas, Multiplexing Modulation, Cellular Systems.

Unit-IV :Medium Access Control

Motivation for specialized MAC, SDMA,TDMA ,Fixed TDM, Classical Aloha Slotted Aloha, CSMA , Multiple Access with collision avoidance , CDMA .

Unit-V :Telecommunication and Satellite Systems

GSM, Mobile services , System architecture , Applications of satellite systems.

Unit-VI :Wireless LAN

Infra redVs Wireless LAN, Infrastructure and Ad-hoc network , IEEE 802.11 System Architecture , Protocol Architecture, HIPERLAN, HIPERLAN 1 WATM, Bluetooth , Architecture .

References

1. Mobile Communications Second Edition – By Jochen Schiller (Pearson Education)
2. Mobile Cellular Telecommunications Second Edition-By William C.Y.Lee (Mc-Graw-Hill)



(CS) - 203 C#.NET (4 - Credits)

Unit I :Introducing C#

What is c#, Why C# & Evolution of C#, Character tics of C#, How C# differs from C++ & Java, Introduction to .Net Technology & Framework, The Common language Runtime(CLR)Visual Studio .Net & .Net languages

Features in Visual Studio.net

Integrated Development environment, Start page, Solution explorer window, Class view window, Object browser, Code window, Intellisense, Heap facility, Code Debugging, Project types

Unit II :Arrays, String, Operators Properties, Indexers, Delegates & Events

Jagged Arrays, Array &ArrayList class, string class, Boxing & Unboxing variable, Short circuiting operators

Properties, Indexers, Delegates & Events

Properties, Indexers, Delegates, Multicast Delegates, Events

Unit III :Namespace, interface & Exception handling

Creating & using Namespace(DLL library), Creating & using interface, Exception

Unit IV :Multithreading

Understanding System. Threading Namespace, Creating & starting Thread, Threading synchronization & Pooling

Unit V : Windows Application

Event Driven Programming Model, Important classes used in windows application, TextBox& Label Control, Button, CheckBox, RadioButton&GroupBox Control, ListBox&ComboBox control, Month Calendar Control, Docking Control, Tree View Control, Menu & Toolbar control, Dialog Boxes

Unit VI :Database Connectivity, XML & Web Services

Advantages of ADO.NET, Managed Data providers, Developing a Simple ADO.NET Based Application, Retrieving & Updating Data From Tables., Disconnected Data Access Through Dataset Objects



Working with XML

Support for XML in .NET, System.Xml namespace, Working with streamed XML, Implementing document object model in .NET, XPath XSLT in .NET, Using XML with ADO.NET

Web Services

Introduction to web services, Simple object access protocol, Web service description language, UDDI, Creating a web service, Deploying a web service, Using the Web service class, Using the Web service

Reference Books :

1. Programming in C# A Primer - Second Edition By - E Balagurusamy
2. Visual C#.Net By – C Muthu
3. C# 2005 Programming Black Book By Matt Telles&Kogenet Solution Inc.
4. C#.Net Programming Wrox Publication



CS – 204 Compiler Design (4 – Credits)

Unit-I :Introduction to Compilers and Programming Languages

Compilers and translators, The structure of compiler, .Compiler writing tools, High level programming languages, Definitions of programming languages, A lexical and syntactic structure of a language, Data structures, Operators, Statements

Unit-II :Lexical Analysis & Syntax Analysis

Lexical analysis, Role of a Lexical analyzer, A simple approach to the design of lexical analyzer, regular expressions, Syntax analysis, Finite automata, Minimizing number of states of a DFA, Implementation of a lexical analyzer, Context free grammars

Unit-III :Basic parsing techniques

Introduction to parsers, Shift reduce parsing, Top-down parsing, Operator Precedence parsing, Predictive parsers, LR, SLR and LALR parsers.

Unit-IV :Syntax Directed Translation and Symbol tables

Introduction, Syntax directed Schemes5.3 Implementation of Syntax directed translators, Intermediate code, Postfix notation and evaluation of postfix expressions, Parse trees and syntax trees

Symbol Tables -The contents of a symbol table, Data structures for a symbol table

Unit-V :Error detection and recovery

Errors, Lexical-phase errors, Syntactic phase errors, Semantic errors

Unit VI :Introduction to Code Optimization

Sources of optimization, Loop optimization

Recommended books :

1. Principals of Compiler Design By Alfred V. Aho, Jeffrey D. Ullman
2. Compilers - Principles, Techniques and Tools - A.V. Aho, R. Shethi and J.D.
3. Introduction to system software By D. M. Dhamdhare



CS – 205 Elective 1 :Elective Discrete Event System simulation (4 – Credits)

Unit I: Introduction to Simulation

System and System environment, Components of system, Type of systems, Type of models, Steps in simulation study, Advantages and Disadvantages of simulation.

Unit II :Simulation Principles, Examples and Softwares

Simulation Examples- Simulation of Queuing systems, Other examples of simulation.
General Principles- Concepts of discrete event simulation, List processing, Simulation Software-History of simulation software, An Example Simulation, Simulation Packages, Trends in simulation software.

Unit III :Statistical Models in Simulation

Useful statistical model, Discrete distribution, Continuous distribution, Poisson process , Empirical distribution.

Unit IV ;Queueing Models

Characteristics of Queueing systems, Queueing notations, Long run measures of performance of Queueing systems, Network of Queues.

Unit V : Random Number Generation

Properties of random numbers, Generation of pseudo random numbers, Techniques for generating random numbers, Tests for random numbers.

Unit VI : Input Modeling

Data Collection, Identifying the Distribution of data, Parameter estimation, Goodness of fit tests, Selection input model without data, Multivariate and Time series input models.

Text Books:

1. Jerry Banks, John Carson, Barry Nelson, David Nicol, [Discrete Event System Simulation](#)
2. Averill Law, W. David Kelton, [Simulation Modeling and Analysis](#), McGRAWHILL



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References Books:

1. Geffery Gordon, [System Simulation], PHI
2. Bernard Zeigler, Herbert Praehofer, Tag Gon Kim, [Theory of Modeling and Simulation], Academic Press
3. NarsingDeo, [System Simulation with Digital Computer], PHI
4. Donald W. Body, [System Analysis and Modeling], Academic Press Harcourt India
5. W David Kelton, Randall Sadowski, Deborah Sadowski, [Simulation with Arena], McGRAW-HILL.



CS – 205 Elective 2 : Distributed Computing (4 – Credits)

Unit I: Introduction to Distributed System

Goals, Hardware concepts, Software concepts, and Client-Server model. Examples of distributed systems.

Unit II :Communication

Layered protocols, Remote procedures call, Remote object invocation, Message oriented communication, Stream-oriented communication.

Unit III: Processes

Threads, Clients, Servers, Code Migration, Software agent.

Unit IV: Naming

Naming entities, Locating mobile entities, Removing un-referenced entities.

Unit V :Synchronization

Clock synchronization, Logical clocks, Global state, Election algorithms, Mutual exclusion, Distributed transactions.

Unit VI: Consistency and Replication

Introduction, Data centric consistency models, Client centric consistency models, Distribution protocols, Consistency protocols.

Text Books:

1. A. Taunenbaum, “*Distributed Systems: Principles and Paradigms*”
2. G. Coulouris, J. Dollimore, and T. Kindberg, “*Distributed Systems: Concepts and Design*”, Pearson Education

References:

1. M. Singhal, N. Shivaratri, “*Advanced Concepts in Operating Systems*”, TMH



CS – 205 Elective 3 :Network Programming (4 - Credits)

Unit I :Introduction

A Simple Daytime Client, Protocol Independence, Error Handling: Wrapper Functions, A SimpleDaytime Server [Book-1]

Sockets Introduction

Socket Address Structures, Value-Result Arguments, Byte Ordering Functions, Byte ManipulationFunctions, inet_aton, inet_addr, and inet_ntoa Functions, inet_pton and inet_ntop Functions,sock_ntop and Related Functions, readn, writen, and readline Functions, isfdtype Function[Book-1] What is a Socket? Using Sockets [Book-2]

Unit II :Elementary TCP Sockets

Socket Function, connect Function, bind Function, listen Function, accept Function, fork andexec Functions, Concurrent Servers, close Function, getsockname and getpeername Functions[Book-1]

Unit III :TCP Client-Server Example

TCP Echo Server: main Function, TCP Echo Server: str_echo Function, TCP Echo Client: mainFunction, TCP Echo Client: str_cli Function, Normal Startup, Normal Termination, ConnectionAbort before accept Returns, Termination of Server Process, SIGPIPE Signal, Crashing of Server Host, Crashing and Rebooting of Server Host, Shutdown of Server Host [Book-1]

Unit IV :I/O Multiplexing: The select and poll Functions

I/O Models, select Function, str_cli Function (Revisited), Batch Input, shutdown Function, str_cli Function (Revisited Again), TCP Echo Server (Revisited), pselect Function, poll Function, TCP Echo Server (Revisited Again) [Book-1]

Socket Options

getsockopt and setsockopt Functions, Checking If an Option Is Supported and Obtaining theDefault, Socket States, Generic Socket Options, IPv4 Socket Options, ICMPv6 Socket Option, IPv6 Socket Options, TCP Socket Options



Unit V :Elementary UDP Sockets

recvfrom and sendto Functions, UDP Echo Server: main Function, UDP Echo Server: dg_echoFunction, UDP Echo Client: main Function, UDP Echo Client: dg_cli Function, Lost Datagrams, Verifying Received Response, Server Not Running, Summary of UDP example, connect Function with UDP, dg_cli Function (Revisited), Lack of Flow Control with UDP, Determining Outgoing Interface with UDP, TCP and UDP Echo Server Using select [Book-1]. User Datagram Protocol, File Transfer, Error Handling [Book-2]

Unit VI :Protocols, Sessions, State, and Implementing Custom Protocols

State vs. Stateless, Methods for Maintaining State, What Is a Protocol? Designing a Custom Protocol, Our Chat Protocol, Protocol Registration [Book-2].

Referencebooks :

1. Unix Network Programming, Volume 1: The Sockets Networking API, 3/E by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff, PHI
2. The Definitive Guide to Linux Network Programming by KEIR DAVIS, JOHN W. TURNER, AND NATHAN YOCOM, Apress.